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[For the American Railroad Journal, and Mechanics' Magazine.]

PRESERVATION OF TIMBER.

MR. EDITOR: In your Journal of the 15th instant, which, being from home, I did not receive until just now, is an article, pp. 234—235, adverting to the process of curing timber, etc., by the sulphates of iron and copper, and admonishing the public against "the too hasty adoption" of it.

I am unwilling to impute to "Z." any extension of motive beyond that for which he would be credited; and, being not only willing but desirous that the fullest and justest knowledge may be possessed of the character and value of the process, I will join him in contributing, without reserve, all in my power to that object. I refer the public and him, therefore, to another article on the same subject, happily, though accidentally published in the same number, pp. 248—249, containing an "Extract of a letter from James Archbald, Esq., etc." To M. Boucherie's experiments on the pulp of beet this "extract" furnishes the best, and, as I deem it, a sufficient reply. I willingly leave them to be balanced against each other.

And, for the "wooden pavement in 6th street," I invite attention to the following certificate of the city commissioner, Mr. Wallace, and the city carpenter, Mr. Thorn, by whom that matter is represented both more favorably and more correctly:

"To correct an erroneous and injurious impression, entertained by many, relative to the wooden pavement in 6th street, between Chesnut and George streets,—we certify that only a part of it was

prepared according to Dr. Earle's process with the sulphates of iron and copper, the remainder being prepared with lime; that the former is still perfectly sound, except six or eight blocks, which, from examination, appear to have been originally defective, (the entire wood of that pavement is of hemlock that had been long kept and was very much injured in its quality;) and that the remainder of it, (prepared with lime) up to the line where the former ceases, is so far decayed that at this time, it almost requires renewal. The contrast between the two portions of that pavement is, in short, of the most obvious and conclusive kind.

"T. K. WALLACE, *City Commissioner.*
"ENOCH THORN, *City Carpenter.*"

"PHILADELPHIA, *April* 25, 1842."

It is a pity "Z.," who would seem to mean well, was so easy of "belief" in stating as facts what very little trouble would have informed him were not such. By such carelessness or indifference, he should remember that he may mislead the public, and injuriously affect the interests he professes a desire to protect. But it is hoped that if he should have at his command any better and more-to-be-relied-on admonition on this subject he may not withhold it.

E. EARLE.

PHILADELPHIA, *April* 25, 1842.

[For the American Railroad Journal and Mechanics' Magazine.]

JUDICIOUS TARIFF OF TOLLS AND FREIGHT.

Mr. Ellet, with a praiseworthy zeal for the enlightenment of the public, published some two or three years ago an "*Essay on the Laws of Trade*," but which we rather fear, from the formulæ in which it is expressed, has been read but little beyond his own professional brethren, and hard for some of them to understand. Few, in these days, are found with the patience, if they have the requisite knowledge, to solve a problem in algebra, and it is very rare that that science as well as Greek are not driven from the mind very soon after it becomes occupied with the cares and duties of active life. It used to be that the longest way about was the shortest way home in true knowledge, but people have of late been so spoiled by the many "short cuts" to arrive at it, that anything else is generally neglected.

The subject of a judicious tariff of tolls and freight on transportation is a highly important one; and although they ultimately adjust themselves, yet it would be well to have them systemized as proposed by Mr. Ellet. It is generally assumed in this country,

that one cent per ton per mile for toll, and the same for freight, is the cost, including a fair profit for the transportation on a canal, reference not being had to capacity, lockage, etc.; and above all that the cost must depend on the amount of tonnage which passes over it. With the majority canals and railways are all alike. It is rarely adverted to that the sparseness of our population, with its disposition and facility to scatter, rarely concentrates a consumption sufficient to make business equal to the support of a costly improvement not situated in a mineral district, from which alone a large tonnage can be reasonably anticipated.

It is not, however, the present trade which alone should induce an improvement,—the object should also be, and the effect generally is, to increase the old and beget new trade,—and it is well that there is always found enterprise and intelligence enough in a community to invest their means without a calculation of the immediate gain, and Mr. Ellet clearly shows that the indirect compensation from these undertakings is often more than the direct dividends. It is not, however, to be denied that there has been great recklessness among us in carrying them far beyond any probable consumption and consequent business to sustain them.

The following extracts are conveyed in clear terms and gives much of the cream of the essay, in setting forth the importance of a judicious tariff, by which is meant a due attention to the round of interest mutually promoted by a proper adjustment of it. These extracts are particularly worthy of being read and understood by the farming interest, which shares so largely in the advantages of both canals and railways:

"Let us suppose for a moment, that we had determined, from a careful calculation, the charge which our equations would indicate to be the most advantageous for the dividend; and that the tariff for the coal and ore, iron, plaster and wheat, had been regulated with a view to the greatest possible profit under the distribution assumed for the tonnage. On further investigation, we would discover causes for a modification, and, very generally, for a reduction of the charges established.

"We would observe, for instance, that the toll on plaster might give the greatest revenue for the year in question, and for that article taken separately: but that if the charge on each ton were reduced, it would be carried a greater distance on the line, and a greater distance into the interior, to the right and left; that some farmers who had not been able to obtain it before, could now enrich their lands by its use, and others who had previously used but a

small amount, could now increase their purchases; and that, although a slight loss would, perhaps, be experienced in the immediate toll, the company would be indirectly remunerated by the augmented crop of wheat springing from its application.

"The increased supply of wheat would not only pay them again in toll, but would be productive of an increased demand for water for its manufacture. The water would remunerate the company again in rents, and perhaps in the further manufacture of articles on which toll could be levied.

"The additional wheat would produce additional straw and chaff and bran. The straw would go to the further enrichment of the soil, and the re-production of increased crops; the bran to the production of stock, and the stock again to the improvement of the soil. The tanneries are brought into operation by the same cause, and the bark that supplies them increases the toll. Barrels are needed for the flour, tolls are received from the barrels, and water power is purchased for the production of the staves.

"The operation of the same influence,—the reduction of toll on manure,—might be traced in other directions, and to other varieties of produce, and would result in showing the infinite modes in which the income of the company might be augmented by a diminution of its immediate revenue on one item.

"If we trace the passage of the ore from the mine to its numerous applications to the mechanic arts, we will find it not less interesting, and the profits of the improvement not less involved in its various transformations. A reduction of the toll on this article will increase its consumption at the furnace located on the borders of the canal; the proprietor of the furnace pays for the water employed for the blast; the product of the furnace augments the revenue in its transportation to the rolling-mill or trip-hammer, and a new demand for water is created at the forge.

"The activity of the operations at the colleries is augmented to furnish the fuel necessary for the conversion of the ore into metal, or the forests are levelled for the purpose, and new tracts of land thence brought under tillage. The increased operations at the various establishments through which the mineral passes, creates new demand for the machinery needed for their duties, and the talents of the artisan and the labor of the mechanic are brought into requisition.

"The proprietors of the numerous establishments called into existence by this policy, soon find that their interests will be promoted by an extension of their business; and the power thus

created, and the materials that are furnished, for the supply of a limited local demand, become shortly applied to the competition for foreign markets.

"The population is increased, and consequently the products of the labor and the wants of society, are at the same time augmented.

"Such effects are in the first place brought about by the improvement itself, in reducing the cost of transportation, and offering facilities for the profitable application of capital and labor; and analogous results spring from each successive reduction of the charges on the line.

"And so far, they are to be regarded as arguments in favor of keeping always within the limit assigned by the geometrical principles which have controlled our investigations.

"Independently of these considerations, there are others which militate in favor of the same policy, growing out of the constitution of the corporations by which the great lines of improvement of the country are generally constructed.

"Such works are rarely, if ever, undertaken exclusively as objects of immediate speculation. Capital is too valuable here to be invested in enterprises which can at best be expected to return but a moderate interest, and that at a day so distant, that the capitalist looks upon his subscription rather as the property of his heirs than himself And in consequence, investments are seldom made in such objects with a view to the immediate profitableness of the venture as an interest paying fund.

"The stock is held by the individvals whose business is to be enhanced, or whose vacant grounds are to be brought into market, by the growth of the city at the outlet of the improvement, or at the points which are to receive peculiar benefit from the trade of the region through which it is conducted; by the banks that are connected in business with the corporation, and whose operations are to be increased by the general expansion of trade consequent on its ultimate success; by the sea ports at which they terminate, whose existence as cities depends on the successful accomplishment of the design, and whose interest in the project, independently of their interest as stockholders, is directly as the trade which they owe to its completion; and finally, by the commonwealth itself, whose interest as a partial proprietor is of the same character, to the extent to which it reaches, as if it were the sole possessor of the work.

"The interest of the proprietors of the improvement, apart from

that which they possess in the value of the stock, is of various descriptions, and of a character to which it is difficult to assign a value; but it is, to express the idea in mathematical language, a function of the charges upon the line; and consequently, must be regarded in arranging the tariff of toll. For, if after the most advantageous charge in reference to the location and character of the trade is determined, it be found that a certain reduction would produce a certain increase of trade, and that any stockholder would gain more by the increase of the profits of his business due to the change, than he would lose by the diminution of his dividend; then, so far at least as that individual is concerned, it would be proper to make the reduction. And considering the constitution of such corporations, it appears to be probable that there are few connected with them whose interests would not be individually affected in this way."

Considerable modifications have of late been made in the charges on railways since the opening of the Great Western road from Boston to Albany and the Philadelphia and Pottsville railway. The reductions made on these lines astonish the advocates of canals, and are a total overthrow to the doctrine so long tried to be sustained that railways were unsuited for *heavy freight* as it is called, as if there could be a difference, when the weight in contact with *any one* point of the road is made the same, whether passengers, feathers, coal or iron, except indeed, in favor of the latter as the more compact load. We are glad to perceive that other roads, such as the Baltimore and Philadelphia, are coming into the low rate system, having recently reduced their freight to $8 per ton. The Camden and Amboy now alone maintain disproportionably high rates.

Rates of freight on various lines.

New York to Boston, steamboat and railway, 230 miles,—

$5 50 to $7 per ton of 2000 lbs., for groceries and merchandize generally.

Albany to Boston, Western railway, 200 miles,—

1st class, $9 per ton of 2000 lbs., comprising fancy goods, furs, indigo, ivory, jewelry, medicines, dry goods, hardware, teas, spices, wax, etc., etc.

2d class, $6 50 per ton of 2000 lbs., comprising bacon, provisions, sheet and rod iron, wines, hemp, hides, coffee, pepper, etc.

3d class, $5 per ton of 2000 lbs., bar iron, cotton, cordage, tar, sugar, tobacco, rice, molasses, wool, spirits, etc.

4th class, $4 per ton of 2000 lbs., pot and pearl ashes, pig iron, lead, lime, plaster, timber, fish, coal, bricks, salt, flour (32 cents per barrel.)

New York to Philadelphia, Camden and Amboy railway, 90 miles,—

$15 to $20 per ton, on merchandize generally.

Philadelphia to Baltimore, Philadelphia and Baltimore railway, 93 miles,—

$8 per ton on merchandize generally.

Philadelphia to Pottsville, Philadelphia and Pottsville railway, 94 miles,—

$4 25 and $5 25 per ton, on groceries and merchandize generally.

$1 50 to $3 per ton, on coal and other heavy goods.

[For the American Railroad Journal and Mechanics' Magazine.]

ENGINEER'S OFFICE, SUSQUEHANNA DIVISION,
NEW YORK AND ERIE RAILROAD,
ELMIRA, *April* 14, 1842.

MR. EDITOR: Since the publication of my communication on "*railroad piling*" in your Journal of March 1st, I have received many letters from engineers in different parts of the Union, requesting me to continue the subject in your valuable Journal, as they feel a deep interest in this *new* and *important improvement* in railroad construction, and are very desirous of knowing the method adopted on this division, to ascertain if the timber used was of suitable quality and dimensions, and the workmanship properly done. In compliance therefore with the wishes of those who have expressed a desire for "further information relative to our experience in railroad piling," and your own request, I send you the following additional extracts from my testimony upon this subject, when before the State Investigating Committee, in October last, and will cheerfully give any further statements that engineers or others interested in the construction of railroads may desire, and thereby contribute my mite towards the spreading of *practical knowledge and experience* in railroad construction throughout the country.

With respect, I remain truly yours,

C. B. STUART,
Chief Engineer Susquehannan Division,
New York and Erie railroad.

Extract from the deposition of C. B. Stuart, Civil Engineer, before the State Investigating Committee, at Elmira, October 30, 1841.

"*Question* 10, *by the chairman.*—What is the system adopted, if any, to ascertain whether the timber and piles conform to the specifications adopted by the company, and whether the piles are properly driven?

"*Answer.*—An inspector of pile road is stationed at each steam pile driver, whose duty it is to be on the work *constantly*, while the machine is in operation, and to see that every pile is driven to a firm foundation, and that they conform to the central line staked out by the engineer, and are sawed off to the grade line, as indicated on the profile by stakes given by the engineer. In case the piles are driven out of the line, it is his duty to direct the foreman or superintendent of the machine to drive other piles along side of them in the proper place. If the piles first driven are not long enough to reach the solid bottom, a second pile is placed on the top of the first, well secured by an oak tree-nail or iron rod at the joint; the second pile is then driven at least *five* feet below the surface of the ground, and until the first pile reaches the solid bottom. It is required that the last blow of the pile-ram, weighing 1200 pounds and over, and falling through a space of 30 feet, shall not settle the pile more than two inches; the force of which below is considered equal to the pressure of 150 tons. When the second pile will not drive to the depth of *five* feet below the surface of the ground,—the first pile having reached the solid bottom,—a third pile is used, of the requisite length to reach from the grade to the solid bottom, and driven in their stead. On the certificate of the inspector, that any sub-contractor, foreman or superintendent neglects or refused to do his work in a proper manner, and to his satisfaction and acceptance, I have the power to certify to the commissioner, such sub-contractor, foreman or superintendent, and upon such certificate, the commissioner has power to have him discharged from the service of the contractors, and he cannot again be employed in such capacity. In case extra piles are required to be driven, owing to the unskillful manner of driving the first, the contractors are required to pay for the extra piles so used. The inspector makes weekly reports to me, at my office in Elmira, by mail, stating the number of piles driven during the past week, the length of the piles so driven, and the height that they are sawed off from the surface of the ground; and also the quantity of piles delivered for the use of the machine under his charge, by the several contractors for pile timber. At the end of each month, these

reports are compared with the returns and certificates of the resident engineer, in the employ of the contractors; if the amounts correspond, the voucher is made out, and certified to by me as correct; and in case the two returns vary in quantity, the work is measured by my principal assistant engineer, and the true quantity returned by them; and upon their return my certificate is based. There is an inspector for superstructure timber in each county through which the road passed on this division, whose duty it is to inspect all the timber delivered for the superstructure of the road, according to the contract and specifications for the same; and to see that it is properly piled up, true and even, so as to protect it from springing or warping. These inspectors make weekly reports, directed to me at Elmira, by mail, of the quantity delivered by different contractors, upon which reports, the monthly vouchers are based and certified by me. The inspectors of bridges make weekly reports of the amount of timber delivered for the several bridges under their charge,—by whom delivered, together with the quantity of timber framed and put together for the foundations and superstructure of the bridges, and the number of piles driven for their foundations. The bridge inspectors have the same power over the foremen of the machines and mechanics under their direction, as the pile road inspectors have, as before stated.

"*Question* 11.—How many inspectors of piled road, of bridges and of superstructure timber, are there in the employment of the company on this division, and what are their wages respectively?

"*Answer.*—Eight inspectors of piles and piled road, being due to each steam pile-driver, the wages of these inspectors are $40 per month, with one exception, which is $50. There are four inspectors of bridges, each having charge of a pile machine and a party of mechanics engaged in the construction of bridges. The wages of these inspectors are $60 per month each, with one exception which is $52. There are three inspectors of superstructure timber, at $3 per day, including travelling expenses, each of them having charge of a division of nearly forty miles in length.

"*Question* 36.—Do you consider it necessary to have inspectors of piles and piled road on this division; and do the depth that the piles are driven vary materially within short distances on the same general surface of the ground, owing to the sub-soils?

"*Answer.*—I consider it absolutely necessary for the stability of the road, to have competent inspectors *constantly* in attendance while the piling machine is in operation, to see that every pile is driven to a solid bottom, and also to see that all the piles used in

the work are of proper *size* and *length*, and of *perfect soundness*.

"It frequently occurs that two piles driven at the same time on opposite sides of the machine, of the same diameter and length, will vary from one to three feet in the depth they can be driven by hammers of the same weight, owing in some instances to the change in the sub-soil, in others to the pile coming in contact with a large stone a few feet below the surface. On the same general surface of the country, where, to all appearance, the character of the soil was uniform, and within fifty feet on the road, I have seen piles vary from ten to fifteen feet in the depth they would penetrate the soil, which makes it frequently necessary to order longer piles, than the previous soundings with an iron rod (made for that purpose) indicated as necessary.

"No one, unless in *constant* attendance, could know that the piles were driven to the solid bottom, as it is of common occurrence to find a bed of quick sand, some five or ten feet below the surface of the ground, and when the pile has penetrated through this strata of quick sand, to find a hard bottom of gravel or clay; unless their lower bed of solid earth is reached by the pile, the stability of the road cannot be depended upon; any deficiency on this point could not be detected until after the road was completed, unless an *inspector was constantly present*. Indeed, so necessary do I consider the constant supervision of an inspector to attend the machines, that I have, in my written orders to them, (a copy of which is hereunto annexed, marked F.) required their presence during the *whole time the machine is in operation;* and for a violation of this duty, have not hesitated to discharge them from the service of the company. From the first commencement of pile driving on this division, in May, 1840, till the spring of 1841, I had no piled road inspectors, (whose duty it was to attend constantly at the machines,) but found by experience, that the interest of the company, as it regarded the permanency of the road, required their appointment. I think the character of the work that has been done this year on the piled road, since the appointment of inspectors, is at least twenty per cent. better than that done last year, by the same contractors.

"It is the duty also of these inspectors to inspect the piles delivered for the machines under their charge, respectively; which timber is furnished by the company, and *not* by the contractors who drive the piles.

"The engineers who stake out the work for the pile machines, are employed by the contractors that do the piling and grading, and have no charge of the timber delivered for piles, for the use

of the machines. The piles are driven by sub-contractors, in the employ of the contractors, (Manrow and Higinbotham) and are paid by them certain prices *per mile*, and not by the lineal foot of pile.

"On the Syracuse and Utica railroad, where the piles for pile-road were driven by persons employed by that company by the day, (and who of course had no interest in slighting the work,) and where the work was daily inspected by the Engineer's in the employ of the company, it has been discovered, since the completion of that road, that many of the piles were *not* driven to a firm or solid foundation, which neglect causes much trouble and expense, in keeping such portions of the road in good adjustment; this imperfect work was mainly the result of a competition or emulation between the superintendents of the several machines, each one endeavouring to recommend himself to the fovorable notice of the company, by doing the largest amount of work in a given time. This could have been prevented, only by the *constant* attendance of a competent inspector, during the progress of the work.

"I do not hesitate to say, that all the irregularities found on the piled-road of that work, are owing to the piles not having been driven to a solid foundation, for the want of a sufficient number of blows by the pile-hammer. Thus you will see the necessity of having a competent inspector in attendance at each machine, to guard against these defects; and more especially is this required where piling is *not* done by the *day*, but by *contract*.

"*Question* 37, *by the Chairman.*—How much does the employment of inspectors for each machine, increase the expense of constructing the piled road, per mile?

"*Answer.*—Not to *exceed* $20, in addition to the expense that would be necessarily incurred, for the inspection of pile timber, and testing of the measurements that are made by the contractors engineers, of the quantity of work done each month; and which duties are now performed by the inspectors; these measurements are the more necessary, as the amount paid the contractors for the work varies with the length of the piles driven, and the heighth that they are sawed off above the surface of the ground."

(F.)

HEAD QUARTERS' ENGINEER DEPARTMENT,
SUSQUEHANNAH DIVISION, N. Y. & E. R. R.
OWEGO, *May*, 1841.

Orders to Inspectors.

"1st. It shall be the duty of each and every inspector employed

to inspsct the mechanical work on the Susquehannah Division, to see that the workmanship is done in accordance with the printed specificatiens and plans furnished him, (unless otherwise directed by the Engineer,) and to report in writing, to the Chief Engineer of the Division, or in his absence to one of his principal Assistant Engineers, the name of any person or persons in the employ of the contractors, either as sub-contractor, foreman or laborer, who shall neglect to perform their duty promptly and faithfully, or construct the work to the entire satisfaction of the inspector.

"2d. The inspector having charge of the driving of piles for the piled road or for the foundations of bridges, will be required to attend personally to the work during the time the machine is in operation, and to see that the piles are driven to a solid and firm foundation, and that the requisite timber is punctually delivered according to the contracts for the same, inspected and properly marked before being used in the work, and no timber to be used in the work unless accepted and marked by the inspector.

"In case of the failure of the timber contractors to deliver the timber as fast as required on their contracts, the inspector shall report the same in writing to the Chief Engineer, directed to his office at Owego, stating the quantity of timber required on the contract, to complete the same, together with the cause of such failure, provided the same can be assertained.

"3d. Each inspector is required to report any deficiency that may occur in the delivering of piles for the machines at least one week previous to the time they shall be required for use.

"4th. It shall be the duty of the inspector to see that the piles are butted evenly, on the butt or head, and sharpened with a true taper at the point. Piles one foot and under in diameter at the butt, to be sharpened not less than two and one half feet from the point, and those over one foot in diameter, not less than three feet.

"5th. It shall be the duty of each inspector to forward by mail, on the Saturday of each week to the Chief Engineer at Owego, a statement, showing the time he has been employed during the week in the company's service, and the kind of duty performed each day during that time, the amount of timber inspected by him, and the amount and kind of work that he has inspected and accepted, together with the number of piles driven by each machine under his charge, and to furnish a copy of this statement to the Assistant Engineer having charge of the section on which the said Inspector is employed.

"6th. Any neglect on the part of either of the inspectors, unless prevented by sickness, to perform these orders, will be considered good and sufficient reason for his dismissal from the service of the company.

"By order of

"C. B. STUART,

"*Chief Engineer Susquehannah Division,*

"*New York and Erie railroad.*"

[For the American Railroad Journal and Mechanics' Magazine.]

SOME REMARKS ON THE MANUFACTURE OF BAR IRON IN NORTHERN NEW YORK. *By* W. R. CASEY, *Civil Engineer.*

[Concluded from page 263.]

It has been frequently remarked by Geologists—by Dr. Lyell among the rest—that the Geological Survey of New York has been the means of saving large sums to those who were endeavoring to discover coal in various districts in which that survey has shown, that coal cannot exist. The rocks which always underlie the coal formation are here found on the surface. A little attention to the published reports of the Geologists would, in the year 1840, have saved the State about $10,000 in the survey of the Northern railroad. The success of that road was based on its mineral resources, yet one of the lines runs through a country in which, practically speaking, there can be no mineral resources. The formation is principally Potsdam Sandstone, as Professor Emmons observes, "one of the most barren rocks in the State."

This, as regards mineral wealth, barren route—had been surveyed by Mr. Hutchinson for a canal in 1825, and by Mr. Johnson for a railroad in 1838. The features of the country were therefore well known; and, as the Commissioners of the Survey themselves assert, (Doc. 43. 1841 p. 13.) that "the principal sources of wealth in these counties are to be looked for in their immense deposites of iron ore, and of other valuable mineral substances," it would not appear unreasonable to expect that some enquiries should have been made, as to whether any really valuable mineral substances were found in the neighborhood of the several routes. This information would have been given by the State Geologist in a single hour and, as already observed, the people would have saved about $10,000, by avoiding a re-survey of a route which itself avoided "the principal sources of wealth in these counties." These remarks are consider-

ed useful as showing the really practical results and great importance of Geological Surveys, as well as their intimate connection with Civil Engineering in other matters than deep cuts and tunnels.

The most valuable deposites of iron ore are found in Clinton and Essex counties. The greatest deposite is found at Adirondack in Essex, the principal manufactories are in Clinton, and are supplied from the Arnold and other veins in the southern part of the county. A considerable quantity of pig iron is made at Port Henry in Essex county, but the manufacture of bar-iron is in a great degree confined to the neighborhood of the "Arnold ore" which is worked without separation. This ore is found within 2 miles of the Au Sable river, which divides the counties of Clinton and Essex, has been worked to a depth of 250 feet, sells at the mine at from $4 to $5 per ton, and is hauled, over a hilly country, through deep sand, from 2 to 20 miles to the various forges on the Au Sable and its tributaries and on the Saranac. In proof of the high value set on this ore, the following statement is given on the authority of the President of the Peru iron company. That company own a mine within half a mile of their works—the ore of which is equal to any in the county, except the Arnold ore—yet they find it more to their interest to pay $4 per ton for the latter, hauling it 4 times as far, as to work their own ore which requires separating. They consider their own mine valuable, principally because it renders them independent of the Arnold vein should the proprietors of the latter be too exacting. The ore from that vein is raised from a depth of about 80 feet in general and, should the hill in which it is found be tunnelled near its base, the ore might be afforded at a much lower rate, when it would entirely supersede the ores which require separating and which are still used to a limited extent. No less than 12 veins are found within a distance of a few miles, but one alone is sufficiently pure to work in the forge as it comes from the mine. This remark applies to veins sufficiently large to be worked and not to small seams of pure ore which are occasionally met with. Practically speaking therefore, the manufactories of bar-iron in the counties of Clinton and Essex are supplied from the Arnold and adjacent veins, in or near the town of Au Sable.

The forges are nearly all within 15 miles of these mines, on different streams. There are in all 77 forge-fires—14 on the Saranac, the remainder on the Great and Little Sable and tributaries. Six of these forge-fires on the Saranac draw a part of their supply, the others are exclusively supplied from the mines of Au Sable.

The expense of hauling ore 15 miles has induced the proprietors of the former to use in part a poor ore found in their immediate neighborhood. Great skill has necessarily been acquired in finding veins of iron ore, the country has been examined again and again, yet the really valuable ores of Clinton county—though inexhaustible in quantity—would be represented by a speck on the map of New York.

The quantity of bar iron produced in 1841 was 5,500 tons, the greater part of which was cut into nails. This is nearly equal to the total export from England 40 years ago and is about one tenth the quantity of bar iron produced in the State as given in the *census;* it is probably much nearer one half—perhaps considerably more. The census must include blooms from New Jersey, etc., rolled in this State and perhaps bar-iron made from Scotch and American pig. Little iron has ever been made in the river counties, still less in the central and southern, and, of the 8 northern counties two only, Clinton and Essex, can be said to have any claims; the other 6 (Franklin, St. Lawrence, Jefferson, Lewis, Hamilton and Herkimer,) turning out only a portion of the small quantity of bar iron and nails required for their own use. Some of these counties as well as the State of Vermont are in part supplied from the Au Sable forges, besides which the latter takes considerable quantities of ore from Port Henry in Essex county to be worked on the eastern shore of Lake Champlain. Again, the Legislature has directed a commissioner to ascertain whether the convicts could not be advantageously employed in mining iron ore, and he was directed to inspect the mines of the north—no other part of the State even puting in a claim. This could not have well taken place, if the north only made one tenth of the bar iron produced in the State. Indeed if any district had produced one fifth of the yield of the Au Sable mines, the north, with its slight population, would not have been considered the only section entitled to notice as an iron region. These circumstances, confirmed by the results of numerous enquiries, lead the writer to believe that the total quantity of bar-iron made from the ore in New York in 1841, fell short of 10,000 tons—an amount not exceeding the capacity of the forges of Clinton and Essex which, owing to the depressed state of the trade, are not nearly worked to their capacity. The greater part of these forges have sprung into existence within a few years, the trade is yet in its infancy and, with any thing like stability in the business of the country, would rapidly increase. The quality of the iron is excellent, very tough and soft.

The ore is the magnetic oxide of iron and is found in veins in a reddish granite, dipping at an angle of 70 to 80 degrees.

The manufacture of bar-iron is confined principally to the valley of the Au Sable, because in that neighborhood alone are ore and water power found together within a reasonable distance of Lake Champlain. These advantages will also do much to maintain its present preeminence, though, as roads are made into the interior, other districts will be reached where rich deposites of iron ore exist. By far the most important of these, is the wonderful deposite of the purest ore at Adirondack in the town of Newcombe in Essex county. In referring to "other collections of magnetic oxide of iron, in this and the neighboring counties," Professor Emmons remarks, that, "though they are important and have been successfully worked, still, in comparison of quantity with those of McIntyre, (the iron works at Adirondack) they are only as the spatterings from the great cauldron in which these ores have been formed." (Assem. doc. 50. 1840, p. 298.) Again, (p. 296.) "Probably no portion of the world can vie with McIntyre in its ores of irons; even the far famed iron mountains of Missouri are eclipsed by the rich ores of Essex county, New York; and if not in quantity, at least in quality," etc. One of these veins is 2½ miles long and 500 feet wide—another is above 3000 feet long and 700 feet wide. The former is elevated 2 to 600 feet above the lake and is litterally a mountain of ore. Dr. Beck gives the following analysis (ibid. p. 65.) "Protoxide and peroxide of iron 92.15, earthy matter principally silica 7.85. Proportion of metallic iron about 66, in 100 of the ore." The experiments, by Mr. Clay's process, alluded to in the first part of these remarks were made with this ore. The forge has not been worked for some years owing to the expense and inconvenience of carrying on works 40 miles from the lake in a mountainous region with a poor road, badly located. This ore is found in Labradorite and differs entirely in its qualities from the ores of Clinton. The iron is very hard and tough and, like Swedish, has a remarkable affinity to steel, of which an instance has been given in the last number of this Journal. It will answer well for chain cables for which the Au Sable iron has been found to be too soft. One of the specimens tried by Professor W. R. Johnson of Philadelphia, was torn asunder by a weight of 67,000lb. pr. sq. inch, the average strength of 19 trials with 4 bars being 58,912lbs., that of, English cable bolt (E. V.) 59,105lbs.—Russia 76,069lbs. It is proper to observe that the iron of Essex county, was made in the rudest way under every disadvantage; had it been as skillfully

manufactured as the English cable bolt, it would probably have fallen little short of the Russia iron.

With the common forge this mine could be of little value for many years, but if Mr. Clay's process succeed on a large scale, it must soon be worked, as the superior quality of the iron will justify the additional cost of transportation to the lake. Viewed in connection with this single deposite of ore, the new process must be considered not only important to the State but to the Union.* The enormous size of the veins has led Professor Emmons to suggest that the magnetic oxide may be "one of the constituent rocks of the globe, and ought to be described as such, and as it appears beneath the hyperthene rock, which is a variety of granite, it ranks lower in the series than the latter." Lastly, the allusion to this as the "great caldron" is well borne out. For the magnetic oxide is found only in the adjacent parts of the neighboring counties, as in the south-eastern part of St. Lawrence, in the southern half of Franklin, in southern Clinton, in eastern Essex and several localities between Adirondack and the Erie canal, but not in the neighborhood of Ontario or the St. Lawrence. These veins may be said to radiate from Adirondack as the grand centre of the upheaval of the Labradorite and the magnetic oxide of iron; the latter appearing near the base of the highest mountains in the State, composed principally of the former, and not again showing itself till we reach the coast whence it derives its name; which, proverbially inhospitable as it is, can scarcely exceed in wildness and savage grandeur the mountains and precipices of Adirondack.†

NEW YORK, *May*, 1842.

[From the New York Tribune.]

MR. LYELL'S FIFTH LECTURE ON GEOLOGY.—ORIGIN OF COAL.

[Continued from page 288.]

For even in the tropical zones, where we meet with large developements of the *caulopteries*, their general growth is much smaller than these fossil remains. So is it with all the plants of the fir tribe; many of them of which we find fossil remains in the coal now exist only in the southern latitudes, where no coal is found. The *araucarie* we now find in Chili, and other warm parts of the

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* It is possible that the innumerable beds of peat found in northern New York, may some day be used in the manufacture of iron, and serve, to some extent, as a substitute for mineral coal.

† Three or four miles north of the works is the "Indian pass" through the mountains, the western side of which is a vertical wall of rock 1200 feet high. A few miles to the north east stands Mount Marcy, more than a mile high, with numerous other mountains, but little inferior in altitude.

globe, but never at the north, where its fossils abound in coal. The gigantic plants of the *equicetaceous* tribe are also found to be much smaller now in hot latitudes than are their fossil remains. This would lead to the inference that the climate in northern latitudes was then much warmer and more moist than it is now in any part of the globe. The same thing is made evident by a comparison of these fossils *sagillaria* with those which now attain their greatest size in the islands of the Pacific. I have also found several plants, as the *asterophyllites* in the Apalachian chain, this year, which I have also from Nova Scotia and Europe, and which cannot certainly be referred to any living families. These all, however, bespeak a terrestial vegetation, though occasionally found mixed with marine shells and corals.

Another class of fossils common in coal shales is the *lepidodendra* —somewhat allied in form to the modern *lycopodiums*, or white mosses. Though the mosses of the present day are never more than mere shrubs even in the warmest regions, yet at the carboniferous period they attained an enormous developemnt, being 40, 60 or even 70 feet high.

There have been two theories to explain how these plants could have been carried into the sea, estuaries or lakes, and drawn beneath the water and accumulated in the strata so as to form coal. One of them asserts that the plants must have been drifted and buried in the water, since we find them intercollated between different slates or shales; just as plants lie between the leaves of a botanist's *herburium* and are pressed together, so have these ferns been found flattened between the seams of shale. They have been carried from the place where they grew, drifted out to a certain distance; water logged and sunk in the mud and other strata deposited above them, so as to form this intercollation between the different leaves of clay.

But many believed, from seeing the roots, that the plants grew on the spot where we now find them. But when we come to observe that these roots terminate in different strata, it will seem evident that they were carried down, sunk and struck in the mud as snags are now in the Mississippi. In the quartrose sandstone at St. Etienne, near Lyons, are found a vast number of those *lepidodendra* and *sagillaria*. No one apparently can doubt that these drifted to their present position, and that they were afterwards covered with sand brought down by rivers. Many appearances favor this hypothesis. Sometimes we find beds of marine shells, then vegetabe matter and then a mixture of fresh water and marine shells.

But though these facts may be thus explained the discoveries that are being made lead geologists to come round more and more to the opposite view of the case—to the hypothesis which refers the growth of large beds of coal to the increase on the spot—after the manner of peat, as it is seen in cold and dark climates. This may appear contradictory to what I said with regard to a change of climate since the carboniferous era; but it is not necessarily so.

The opinion of Werner, confirmed by the speculations of Brongniart, led me to believe contrary to my early impressions, that by far the greater part of the coal had grown in the spot where it is found. Accumulating like peat on the land, the land must have been submerged again and again to allow the strata of sand and mud to be superimposed as we now find them.

In excavating for coal at Belgray, near Glasgow, in 1835, many upright trees were found with their roots terminating in a bed of coal; and only three years ago, in cutting a section of the Bolton railroad in Lancashire, eight or ten trees were found in a vertical position; they were referable to the *lepidodendria* species and allied to the *lycopodiums*, or club mosses. All were within 40 or 50 feet of each other, and some of them were 15 feet in circumference at the bottom. The roots spread in all directions and reached beds of clay, and also spread out into the seams of coal. There is no doubt that these trees grew where they are found, and that the roots are in their original position. The seam of coal has possibly been formed of the leaves which fell from the trees. This is a singular fact; that just below the coal seam and above the covering of the roots was found more than a bushel of the *lepidostrobus*—a fruit not unlike the elongated cone of the fir tree. It has always been imagined that the *lepidostrobus* was the fruit of the *lepidodendra*; but here they are found beneath other trees.

Under every seam coal in Wales is found the fire clay—a sandy, blue mud, abounding in the plants called *stigmaria*. First is the seam of coal, then the fire clay, then another seam of coal and then the sandstone. In one open part of the Newcastle coal field about 30 species of *sigillaria* were discovered: the trunks were two or three feet in diameter. They pierce through the sand in a vertical direction, and after going for some 11 feet perpendicularly, the upper part bends round horizontally, and extends latterally into the sand —and then they are so flattened by the superincumbent strata, that the oposite barks are forced within half an inch of each other. The flutings are beautifully preserved in the flattened horizontal stems. Here we had an ancient forest growing in a bed of clay—buried in some way with sand to a certain depth, and then the upper part was bent and broken off by the water current, and buried in layers of shale and sand. There are many cases of this kind in Wales, where the roots of the trees evidently preserve their original position. Mr. Logan, an excellent geologist, has examined no less than 90 of these seams of coal in Wales. They are so exceedingly thin that they are of but little value in an economical light—yet they are just as important for geological purposes, as if they were thick strata. Under every one of the 90 he has found the fire clay, a sandy mud containing the plants called *stigmaria*. It was discovered years ago that this fire clay existed with the coal mine; but it was not known that it was the floor of every coal seam, and not the roof, which contained this plant in a perfect state. The *stigmaria* appears in the under clay (to use the term employed by miners,) a cylindrical stem, from every side of which extend leaves

—not only from the opposite sides, but from every side; they appear like tubercles, fitting on as by a joint. They radiate in all directions in the mud, where they are not flattened like the ferns. Had they been we might have had leaves in two directions, but not on every side. These plants resemble the *euphorbiaceæ* in their structure, and in some respects are analogous to the coniferous or fir tribes. In their whole structure they are distinct from all living genera or families of plants. In one instance a dome-shaped mass was found with stems and leaves —some of the branches being 20 or 30 feet in length and sometimes longer. It has been thought by Dr. Buckland and other geologists, that these plants either trailed along in the mud at the bottom of swamps, or to have floated in lakes like the modern *stratiotes*.

After Mr. Logan had arrived at this remarkable fact, we became particularly desirous to know if the same fact was true in the United States. When I arrived here in August, I had no idea how far it was true, yet it was known the *stigmaria* did occur; and my first oppertunity to enquire into the fact was at Blossburgh, in the bituminous field in the northern part of Pennsylvania. My first inquiry of the geologist was whether he found stigmaria there. I was answered in the affirmative; and on asking if the plant occured in the *under clay*, he said we could soon settle the point. He had one of the mines lighted up, and the *only plant we could find in the under clay was this Stigmaria:* it existed in abundance—its leaves radiating in all directions, just as in Wales, more than 4000 miles distant. The same crutal appearance was preserved. In the roof of the coal seam were seen different species of ferns,—*sigillari* and *calamites*, just as in North Carolina and in Wales. Afterwards another opportunity occured in the Pottsville region of anthracite coal. Professor Rodgers, the State Geologist, who, though well acquainted with the strata of the district, was as anxious as I was to know if the rule would hold good, examined first at Pottsville and at Maunch Chunk, when the same phenomena was observed. In the first coal mine we come to, the coal had all been quarried away (for the work was carried on in open day) and nothing but the cheeks of the mine remained. The beds, as they have been horizontal, are now not vertical, but have gone through an angle of little more than 90°, and turned a little over; so that what is now the under side was originally the upper; therefore the cheek on the left side was originally the floor of the mine. We now looked at the lower cheek; and the first thing we saw was the stigmaria very distinct; on the other side, but a little way off, were ferns, sigillarieæ, calamites, asterophyllites, *but no stigmaria*. So it was at Maunch Chunk, where we found one 30 feet long with leaves radiating in all directions. At this place there is a bed of anthracite nearly 60 feet thick—a magnificent accumulation of vegetable matter, to which there is nothing comparable in Europe. Except in one place it is perfectly pure.

It has now been ascertained for many years that Professor Eaton was quite correct in affirming the anthracite and bituminous coals

to be of the same age. This is shown not only by their relative position with regard to the red sand-stone, but from the plants found in both being identical.

All the coal fields, therefore, may be regarded as one whole, and the question will occur, how did it happen that the great floor was let down so as to prevent the accumulation of coal and yet plants of so different textures should be found in it? It has been suggested that these plants grewin the swamps; and it is possible to imagine that there may have been morasses fitted only for the growth of the species of plants called *stigmaria;* and that this marsh filled up, this and the other plants became dry, and the leaves accumulated one layer above another, so as to form beds of coal of a different nature from those that preceded. You know it is a common thing for shallow ponds to fill up gradually with mud and aquatic plants and at last peat and trees are formed upon them. A corresponding change is constantly going on in different parts of Europe—the same transition from bogs and marshes to a soil capable of supporting various great trees is taking place, and then the ground is submerged; for always, again and again, we must refer to this subsidence of the soil.

Many of you, I suppose, have seen the morass called the great Dismal in North Carolina and Virginia; and you have probably had an opportunity, as I have, of crossing the northern extremity of it on a railway supported by piles, from Norfolk to Weldon. This is no less than forty miles from north to south, and twenty from east to west, covered entirely with various forrest trees, under which is a great quantity of moss; the vegetation is of every variety of size from common creeping moss to tall cypresses 130 feet high. The water surrounds the roots of these trees for many months in the year. And this is a most singular fact to one who has travelled only in Europe, that, as is the case in the United States, trees should grow in the water, and yet not be killed. This Great Dismal was explored some years since by Mr. Edmund Ruffin, author of the valuable Agricultural Journal. He first calls attention to the fact that a great portion of the vast morass stands higher than the ground that surrounds it; it is a great spongy mass of peat, standing some seven or eight feet higher than its banks, as was ascertained by careful measurements when the railroad was cut through. It consists of vegetable matter with a slight admixture of earthly substance, as in coal. The source of peat in Scotland is that one layer of vegetation is not decomposed before another forms. So is it in Chili, Patagonia and Terra del Fuego. Thus also is it in different parts of Europe, in the Falkland Islands, as Darwin has shown. Thus too, is it in the Great Dismal, where the plants and trees are different from those of the peat in New York. It is found on cutting down the trees and draining the swamp and letting in the sun, that the vegetation will not be supported as it was before beneath the dark shade of the trees. In the middle is a fine lake, and the whole is inhabited by wild animals, and it is somewhat dangerous to dwell near it by reason of the bad

atmosphere it creates. It is covered by most luxuriant vegetation. We find in some places in England that there is a species of walking mosses, which are sometimes siezed with a fancy to walk from their places: the moss swells up, bursts and rolls off, sometimes burying cottages in its path. In some places this peat has been dug into and houses have been found several feet below the surface—curious antiquarian remains. In the same manner the Great Dismal may spread itself over the surrounding country.

In speculating upon the probable climate of the carboniferous period, it is believed that we have only to imagine a different distribution of the land over the surface of the planet than that which now prevails, to produce such a warm and humid climate as must have prevailed when these plants flourished which form coal. It is the existence of high lands near the pole which produces such great cold. If these mountains were to be transferred to the tropical regions, it would immediately lower the temperature of all climates of the earth. Now every one who has attended to the study of rocks and fossils sees at once that the present physical geography of the globe has no reference to its ancient condition. Seas once occupied a large portion of what are now continents, and we also find evidences of marked change in the carboniferous and other strata. In the limestone accompaning the coal we find corals and shells, strongly indicating a higher temperature of the sea, as the plants shadow forth a higher temperature in the atmosphere.

I have been favored with a map illustrating these points by Professor Hall, one of the State Geologists engaged in surveying this State, whose labors will soon be made public. And here I cannot avoid saying that I have been over much of the ground which they have surveyed, and it gives me great pleasure to bear testimony to the accuracy of their labors, to the great pains they have taken, and the science with which they have conducted the survey. I look forward to the appearance of their work, embracing the results of their labors, as *an era in the advancement of science*; and the patronage which has been afforded by the different States of the Union to these surveys is much greater, in proportion to the population, than any European power has ever extended to the advancement of geological science. When we remember, too, the complaints that may be heard in different parts of the State that the geologists have failed to discover any mineral wealth, even in an economical point of view, these scientific researches are of high value, through their greatest interest arises from the promotion of the knowledge of the structure of the globe.

But merely in estimating the mischief they have prevented, we shall see an ample remuneration for all the expenses attending the survey. I have been told that in this State alone more than a million of dollars have been expended since the revolutionary war in boring for coal in formations where *it is impossible to find any*—below the carboniferous strata. I should not, to be sure, have ventured to generalize from Europe as a type and say that the rocks

in the crust of the earth occupy the same relative position here, and the coal would be found always in this country under the same conditions as in Europe. But when for twenty years or more we find coal accompanied by the same plants, and that no valuable fuel has ever been found under any other circumstances we should be safe in saying that none could be found in the older strata. If we begin in the newer beds we may come down to the coal, and find enough coal to pay the expenses of boring for it. But if we begin in the strata beneath the carboniferous we should certainly never reach the coal until we had bored through the whole earth: we might find it at the antipodes but not before.

Thus complaints are made against these geologists not only that they have found no coal, but that they have passed sentence of sterility upon the State, for they say that through all time no coal shall be found within its borders. And when we reflect on the enormous sums that have been wasted upon strata more ancient than the coal, in searching for coal, we shall see the great saving made in consequence of this survey; for when all its maps and sections are published it will be seen how impossible it is to find coal in these mere ancient beds. This is a kind of advantage which is never easily appreciated: because, to prevent mischief is never so clear and palpable a benefit to the multitude as mineral wealth. But one of the greatest advantages which have resulted from these surveys in England, and it will be among the greatest here, is the prevention of this rash and absurd speculation to find coal in strata below that in which those plants known to be essential to the formation of coal are found to exist: and after examining the whole ancient strata, both in the United States and in Europe, there has never been found a single bed of coal where these plants do not exist.

REPORT FROM THE COMMISSIONER OF PATENTS, SHOWING THE OPERATIONS OF THE PATENT OFFICE DURING THE YEAR 1841.

PATENT OFFICE, *January*, 1842.

SIR: In compliance with the law, the Commissioner of Patents has the honor to submit his annual report.

Four hundred and ninety-five patents have been issued during the year 1841, including *fifteen* additional improvements to former patents; of which classified and alphabetical lists are annexed, marked A and B.

During the same period, *three hundred and twenty-seven* patents have expired, as per list marked C.

The applications for patents, during the year past, amount to *eight hundred and forty seven;* and the number of caveats filed was *three hundred and twelve.*

The receipts of the office for 1841 amount to $40,413 01; from

which may be deducted $9,093 30, repaid on applications withdrawn.

The ordinary expenses of the Patent Office for the past year, including payments for the library and for agricultural statistics, have been $23,065 87; leaving a surplus of $8,253 84 to be credited to the patent fund, as per statement marked E.

For the restoration of models, records, and drawings, under the act of March 3, 1837, $20,507 70 have been expended, as per statement marked F.

The whole number of patents issued by the United States, previous to Janurry 1842, is *twelve thousand four hundred and seventy-seven.*

The extreme pressure in the money market, and the great difficulty in remittance, have, it is believed, materially lessened the number of applications for patents. These have, however, exceeded those of the last year by *eighty-two.*

The resolution of the last Congress, directing the Commissioner to distribute seven hundred copies of the Digest of Patents among the respective states, has been carried into effect, as ordered.

Experience, under the new law reorganizing the Patent Office, shows the importance of some alterations in the present law. One difficulty has been hitherto suggested, viz: the want of authority to refund money that has been paid into the Treasury for the Patent Office, by mistake. Such repayment cannot now be made without application to Congress. The sums, usually, are quite small, not exceeding $30. A bill has been heretofore presented, embracing these cases, and passed one House of the National Legislature; but a general law would save much legislation, and be attended with no more danger than now attends the repayment of money, on withdrawing applications for patents. Indeed, several private petitions are now pending before Congress, and are postponed, to to wait final action on the bill which has been so long delayed.

Frauds are practised on the community by articles stamped "patent," when no patent has been obtained; and many inventors continue to sell, under sanction of the patent law, after their patents have expired. To remedy these evils, the expediency of requiring all patentees to stamp the articles vended with the date of the patent, and punishing by a sufficient penalty the stamping of unpatented articles as patented, or vending them as such, either before a patent has been obtained or after the expiration of the same, is respectfully suggested. Almost daily inquiries at the Patent Office exhibit the magnitude of such frauds, and the necessity of guarding effectually against them.

The justice and expediency of securing the exclusive benefit of new and original designs for articles of manufacture, both in the fine and useful arts, to the authors and proprietors thereof, for a limited time, are also respectfully presented for consideration.

Other nations have granted this privilege, and it has afforded mutual satisfaction alike to the public and to individual applicants. Many who visit the Patent Office learn with astonishment that no

protection is given in this country to this class of persons. Competition among manufacturers for the latest patterns prompts to the highest effort to secure improvements, and calls out the inventive genius of our citizens. Such patterns are immediately pirated, at home and abroad. A pattern introduced at Lowell, for instance, with however great labor or cost, may be taken to England in twelve or fourteen days, and copied and returned in twenty days more. If protection is given to designers, better patterns will, it is believed, be obtained, since the impossibility of concealment at present forbids all expense that can be avoided. It may well be asked, if authors can so readily find protection in their labors, and inventors of the mechanical arts so easily secure a patent to reward their efforts, why should not discoverers of designs, the labor and expenditure of which may be far greater, have equal privileges afforded them?

The law, if extended, should embrace alike the protection of new and original designs for the manufacture of metal, or other material, or any new and useful design for the printing of woolen, silk, cotton, or other fabric, or for a bust, statute, or bas-relief, or composition in alto or basso-relievo. All this could be effected by simply authorizing the Commissioner to issue patents for these objects, under the same limitations and on the same conditions as govern present action in other cases. The duration of the patent might be *seven* years, and the fee might be *one-half* of the present fee charged to citizens and foreigners, respectively.

On the first alteration of the patent law, I would further respectfully recommend, that authority be given to consuls to administer the oath for applicants for patents. Inventors in foreign countries usually apply to the diplomatic corps, who are willing to aid any, and have uniformly administered the usual oath prescribed by the Commissioner of Patents; but as the Attorney General has decided, that consuls cannot, within the meaning of the patent law, administer oaths to inventors, a great convenience would attend an alteration of the law in this respect.

It is due to the clerical force of the office to say, that their labors are arduous and responsible—more so than in many bureaux—while the compensation for similar services in other bureaux is considerably higher. A comparison will at once show a claim for increased compensation, if uniformity is regarded. The chief and sole copyist of the correspondence of this office receives only eight hundred dollars per annum.

The Commissioner of Patents also begs leave to suggest the expediency of including the annual appropriations for the Patent Office in the general bill which provides for other bureaux. Objections hitherto urged against this course, inasmuch as the Patent Office is embraced by a special fund, have induced the committee to report a special bill, which, though reported without objection, has failed for two sessions, because the bill could not be reached, it having been classed with other contemplated acts on the calendar, instead of receiving a preference with other annual appropriations so ne-

cessary for current expenses. Were the appropriation for the Patent Office included in a general bill, also designating the fund from which it was to be paid, all objection, it is believed, might be obviated.

During the past year a part of the building erected for the Patent Office has, with the approbation of the Secretary of State, been appropriated to the use of the National Institute, an association which has in charge the personal effects of the late Mr. Smithson, collections made by the exploring expedition, together with many valuable donations from societies and individuals. While it affords pleasure to promote the welfare of that institution by furnishing room for the protection and exhibition of the articles it has in charge, I feel compelled to say that the accommodation now enjoyed can be only temporary. The large hall appropriated by law for special purposes will soon be needed for the models of patented articles, which are fast increasing in number by restoration and new applications, and also for specimens of manufacture and unpatented models. An inspection of the rooms occupied by the present arrangement will show the necessity of some further provision for the National Institute.

The Patent Office building is sufficient for the wants of the Patent Office for many years, but will not allow accommodation for other objects than those contemplated in its erection. The design of the present edifice, however, admits of such an enlargement as may contribute to its ornament, and furnish all necessary accommodation for the National Institute; and also convenient halls for lectures, should they be needed in the future disposition of the Smithsonian legacy. Whatever may be done as regards the extension of the present edifice, it is important to erect suitable outbuildings, and to enclose the public square on which the Patent Office is located.

Some appropriation, too, will be needed for a watch. So great is the value of the property within the building, that a night and day watch is indispensable. The costly articles formerly kept in the State Department for exhibition are now transferred to the National Gallery, where their protection will be less expensive than it was at the State Department, since these articles are guarded in common with others. The late robbery of the jewels, so termed, shows the impropriety of depending upon bolts and bars, as ingenuity and depravity seem to defy the strength of metals. A careful supervision at all times, added to the other safeguards, is imperiously demanded. I am happy to say that no injury or loss will be sustained from the robbery just alluded to, with the exception of the reward so successfully offered for the recovery of the articles.

By law, the Commissioner is also bound to report such agricultural statistics as he may collect. A statement annexed (marked G) will show the amount of wheat, barley, oats, rye, buckwheat, Indian corn, potatoes, cotton, tobacco, sugar, rice, etc., raised in the United States in the year 1841. The amount is given for each State, to-

gether with the aggregate. In some States the crop has been large, in others there has been a partial failure. Upon the whole, the year has been favorable, affording abundance for home supply, with a surplus for foreign markets, should inducements justify exportation.

These annual statistics will, it is hoped, guard against monopoly or an exhorbitant price. Facilities of transportation are multiplying daily; and the fertility and diversity of the soil ensure abundance, extraordinaries excepted. Improvements of only ten per cent. on the seeds planted will add annually from fifteen to twenty millions of dollars in value. The plan of making a complete collection of agricultural implements used, both in this and foreign countries, and the introduction of foreign seeds, are steadily pursued. It will also be the object of the Commissioner to collect, as opportunity offers, the minerals of this country which are applied to the manufactures and arts. Many of the best materials of this description now imported have been discovered in this country; and their use is only neglected from ignorance of their existence among us. The development of mind and matter only leads to true independence. By knowing our resources, we shall learn to trust them.

The value of the agricultural products almost exceeds belief. If the application of the sciences be yet further made to husbandry, what vast improvements may be anticipated! To allude to but a single branch of this subject. Agricultural chemistry is at length a popular and useful study. Instead of groping along with experiments, to prove what crops lands will bear to the best advantage, an immediate and direct analysis of the soil shows at once its adaptation for a particular manure or crop. Some late attempts to improve soils have entirely failed, because the very article, transported at considerable expense to enrich them, was already there in too great abundance. By the aid of chemistry, the west will soon find one of their greatest articles of export to be oil, both for burning and for the manufactures. So successful have been late experiments, that pork (if the lean part is excepted) is converted into stearine for candles, a substitute for spermaceti, as well as into the oil before mentioned. The process is simple and cheap, and the oil is equal to any in use.

Late improvements, also have enabled experimenters to obtain sufficient oil from corn meal to make this profitable, especially when the residuum is distilled, or, what is far more desirable, fed out to stock. The mode is by fermentation, and the oil which rises to the top is skimmed off, and ready for burning without further process of manufacture. The quantity obtained is ten gallons in 100 bushels of meal. Corn may be estimated as worth fifteen cents per bushel for the oil alone, where oil is worth $1 50 per gallon. The extent of the present manufacture of this corn oil may be conjectured from the desire of a single company to obtained the privilege of supplying the light-houses on the upper lakes with this article. If from meal and pork the country can thus be supplied with oil for burning and for machinery and manufactures,

chemistry is indeed already applied most beneficially to aid husbandry.

A new mode of raising corn trebles the saccharine quality of the stalk, and, with attention, it is confidently expected that 1,000 pounds of sugar per acre may be obtained. Complete success has attended the experiments on this subject in Delaware, and leave no room to doubt the fact that, if the stalk is permitted to mature, without suffering the ear to form, the saccharine matter (three times as great as in beets, and equal to cane) will amply repay the cost of manufacture into sugar. This plan has heretofore been suggested by German chemists, but the process had not been successfully introduced into the United States, until Mr. Webb's experiments at Wilmington, the last season. With him the whole was doubtless original, and certainly highly meritorious; and, though he may not be able to obtain a patent, as the first original inventor, it is hoped his services may be secured to perfect his discoveries. It may be foreign to descend to further particulars in an annual report. A minute account of these experiments can be furnished, if desired. Specimens of the oil, candles and sugar, are deposited in the National Gallery.

May I be permitted to remark that the formation of a National Agricultural Society enkindled bright anticipations of improvement. The propitious time seems to have come for agriculture, that long neglected branch of industry, to present her claims. A munificent bequest is placed at the disposal of Congress, and a share of this, with private patronage, would enable this association to undertake, and, it is confidently believed, accomplish much good.

A recurrence to past events will show the great importance of having annually published the amount of agricultural products, and the places where either a surplus or a difficiency exists. While Indian corn, for instance, can be purchased on the western waters for one dollar (now much less) per barrel of 196 pounds, and the transportation, via New Orleans, to New York, does not exceed $1 50 more, the price of meal need never exceed from eighty cents to $1 per bushel in the Atlantic cities. The aid of the National Agricultural Society, in obtaining and diffusing such information, will very essentially increase the utility of the plan before referred to, of acquiring the agricultural statistics of the country, as well as other subsidiary means for the improvement of national industry.

I will only add that, if the statistics now given are deemed important, as they doubtless may prove, to aid the Government in making their contracts for supplies, in estimating the state of the domestic exchanges, which depend so essentially on local crops, and in guarding the public generally against the grasping power of speculation and monopoly, a single clerk, whose services might be remunerated from the patent fund, to which it will be recollected more than $8,000 has been added by the receipts of the past year, would accomplish this desirable object. The census of population and

statistics, now taken once in ten years, might, in the interval, thus be annually obtained sufficiently accurate for practical purposes.

All which is respectfully submitted.

HENRY L. ELLSWORTH.

Hon. JOHN WHITE,
Speaker of the House of Representatives.

COAL FOR STEAMERS IN THE NAVY—STEAM BATTERIES.

It will be seen by an advertisement of the Navy Commissioners in another column, that the proprietors of coal mines are requested to furnish samples of their coal at the Navy Yard in Washington, for the purpose of having experiments made to test the qualities of the different specimens, with the view of ascertaining the kinds best adapted to the purposes of steam navigation in the navy.

The opportunity thus afforded will be a favorable one for proving the excellent qualities of the Alleghany coal in this State, which has been generally considered as possessing highly valuable properties for most of the use to which coal is applied as fuel. The bituminous coal of the Susquehanna valley, large quantities of which may be expected in this market, is also believed to be admirably suited to the purposes of steam navigation.

While we are upon this subject we may take occasion to repeat the expression of our earnest wishes, in which this community, we are sure, heartily join, that practical measures may be speedily taken for establishing some system of steam defences for the Chesapeake bay. The efficiency of steam batteries has not, that we know of, been fully tested; but is it not worth while to make some experiments to ascertain that point? The city of Baltimore and the whole region of the upper Chesapeake are as unprotected now as they were in 1814. The approaches by water to the city of Washington are as unguarded as they were at that period.

In the event of a war it would be highly desirable to have in the waters of our bay, in connection with floating batteries, several strongly constructed steamers, carrying heavy guns, yet adapted for shoal water, so as to allow them to enter the Patapsco, the Patuxent, the Potomac, and other rivers, and to guard the entrances of those important streams. A series of experiments to ascertain the proper form, size and construction of such vessels, might be with propriety commenced immediately. Some time and perhaps several attempts would be requisite in order to attain the desired ends. But every experiment would teach something—and something which cannot be learned without experiments.

Another idea may be here suggested. We see how steadily and perseveringly the British government is going on in the work of strengthening her steam marine. If we should be compelled into a war with England and it would be chiefly a maritime war; and to such an issue Great Britain is probably looking. She has adopted a new policy for this purpose by adding to the number and efficiency of her war steamers—that is to say, she has united with

companies of private individuals for building and keeping afloat extensive lines of powerful steam ships to be used in time of peace for purposes of trade, and for the conveyance of passengers and mails across the ocean, yet adapted in all respects for warlike uses whenever occasion shall arise for their employment in that way. Now, what should prevent the adoption of a similar policy by this government in respect to the coastwise communication between our chief cities on the Atlantic seaboard and the Gulf of Mexico? We could have mail steamers running regularly from Portland and touching at Boston, New York, Norfolk, Charleston, Savannah, Mobile and New Orleans, with others connecting therewith and communicating with Philadelphia and Baltimore—the points of connection being at the Delaware breakwater for the one city and Hampton Roads for the other. These steamers would constitute the best kind of *home squadron;* they would partially pay their own expenses, and thus be of little cost to the government beyond that of construction; and they might be made, like the British mail steamers, ready at any time to receive armaments on board and fitted forthwith for war. An excellent school would thus be provided for the instruction of our officers in the efficient management of steam vessels—a species of skill which is every day becoming of vast importance, and which cannot well be acquired without training.—*Baltimore American.*

SHELL FISH FOR THE LONDON MARKET.

Not long ago, after a boat voyage in the southwest, where well wooded banks dip their bows into a broad, brimful, winding river that opens out from point to point into the semblance of a chain of lakes as it approaches the sea, we landed at a village celebrated for its "crabs"—spacious perforated trunks in which crabs, lobsters and sea crawfish are kept alive for the market. A large smack was lying at this village; and as the tide receded, the men began to discharge her freight. We went on board the craft. Her hold was divided transversely; in one apartment were hundreds of lobsters and sea crawfish; and there were as many crabs next door. The tide had left the wretches heaped upon each other, and among them a scrabling was going on, literally for life. The view of the struggling mass was more than painful; the convulsive motion of the long antennæ of the sea crawfish as they bristled up among the crowd, and the jerkings of the lobster's tails in a vain endeavor to swim away from their misery without water. There was a basket with a whip on a boom, and into these crowded black holes descended booted fishermen. Presently one of those familiars sang out "dead crabs!"—and up came the basket. An experienced glance was thrown over it by some on deck, and the best were picked out and carried to the boiler—thence to be hawked about the country as fresh crabs; but numbers were thrown away as past all culinary help. After a while there was a cry from below of "live crabs!" (males,) and up came the basket with its living load, and down it

was lowered over the side, reversed, and the contents pitched *en masse* into the carb. Here at first was more misery; but at last the wrestling animals became disentangled, and there was almost an air of composure about the stronger martyrs as they crawled off to a quiet nook, there to breathe freely after the torture. The females were treated in the same way.

The more mercurial lobsters occasionally rushed upon their fate; when a basket of them was hoisted up, a particularly vivacious one would every now and then spring out with a sort of demivolte, and, falling on the deck, split his cuirass just above the point where the heart is situated; no sooner was he down and lying all abroad, than off he was hurried to the pot. It was at first a puzzle to think how it happened that they had not torn each other to pieces in the melee; for they were neither pegged nor tied: it turned out that the leading muscles of their claws had been cut, "that they might not quarrel." As in every deep there is generally a lower still, upon the removal of the crustaceans there appeared a tessellated pavement of oysters, and we almost fancied that we could hear them sigh their thanksgiving when the mass that had trampled on them was removed. Not that an oyster is much an object of pity under such circumstances, for he can make himself tolerably comfortable in his closed shell, the suffering of the lobsters, and crawfish must have been terrible; for in them the nervous system is highly developed.

A very little care would have spared the greater part of this agony and saved a considerable part of the eargo. If the well of the vessel had been fitted with iron gratings made to ship and unship, tier above tier, and a proper number had been allotted to each shelf, the crabs and lobsters would have been comparatively at their ease, with enough of moisture about their bronchiœ to enable them to breathe comfortably when left by the tide till they were transferred to the carbs. It must have been asphyxia consequent on the huddling together of such a congeries that killed so many.—*Quarterly Review.*

Perilous Position of St. Petersburg.—It is melancholy to contemplate the constant danger in which this brilliant capital is placed. If Mr. Kohl's picture is not overcharged, the occurrence of a strong westerly wind and high water, just at the breaking up of the ice, would at any time suffice to occasion an inundation sufficient to drown the population, and to convert the entire city with all its sumptuous palaces into a chaotic mass of ruins. The Gulf of Finland runs to a point as it approaches the mouth of the Neva, where the most violent gales are always those from the west, so that the mass of water, on such occasions, is always forcibly impelled towards the city. The islands forming the delta of the Neva, on which St. Petersburg stands, are extremely low and flat; and the highest point in the city is probably not more than twelve or fourteen feet above the average level of the sea. A rise of fifteen feet is therefore, enough to place all St. Petersburg under water, and a rise of

thirty feet is enough to drown almost every human being in the place. The poor inhabitants are, therefore, in constant danger of destruction, and can never be certain that the whole five hundred thousand of them may not, within the next twenty-four hours be washed out of their houses like so many drowned rats. To say the truth, the subject ought hardly to be spoken of with levity, for the danger is too imminent, and the reflection often makes many hearts quake in St. Petersburg. The only hope of this apparently doomed city, is, that the three circumstances may never occur simultaneously, viz., high water, the breaking up of the ice, and a gale of wind from the west. There are so many points of the compass for the wind to choose among, that it would seem perverse in the extreme to select the west at so critical a moment, nevertheless the wind does blow very often from the west during spring, and the ice floating in the Neva and the Gulf of Finland is of a bulk amply sufficient to oppose a formidable obstacle to the water in the upper part of the river. Had the ancient sages of Okhta kept meteorological records, one might perhaps be able to calculate how often in a thousand years, or in ten thousand years, such a flood as we are here supposing might be likely to occur. As it is, the world need not be at all surprised to read in the newspapers one of these days that St. Petersburg, after rising like a bright meteor from the swamps of Finland, has as suddenly been extinguished in them like a mere will-o-the-wisp. May Heaven protect the city!—*Foreign Quarterly Review.*

American Railroads.—It is not many years since the question was arrogantly asked in Europe, "Who reads an American work?" But since then, not only our books but our institutions are deemed worth studying, and even special agents have been occasionally appointed by European Governments or associations, to travel through our land and inspect the peculiarities of our organization. Thus, France sent a commission to study our prison discipline system, and now, the Emperor of Austria has despatched to this country M. Giho, chief engineer of the Emperor's railroad; and Baron de Lehr, chief architect of the Vienna and Rabb Line, for the purpose of examining our railroads and reporting on their merits. It is said that they will be accompanied by several pupils of the Imperial Polytechnic school.

We have more miles of railroad than any other nation; we have longer continuous routes than any other nation, but in elegance of structure, in durability, in judiciousness of arrangements, in safety of transportation, the English roads are decidedly superior to ours. Their's are built for permanence,—ours for profit. They have wisdom on their side, we have thrift on ours.—*Savannah Georgian.*

Joel G. Northrup, of Courtland village, New York has invented a new printing press which although not constructed on the plan of the power press, it is said gives an impression to both sides of the paper before it is withdrawn. Sixteen sheets (printed on both sides) per minute can be stricken off by this press, yet its cost will not exceed one of those in common use.